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(54) **MODULAR TELECOMMUNICATION TEST UNIT**

(75) Inventors: **Pere Baleta**, Santa Feliu de Llobregat (ES); **Salvador Borras**, Barcelona (ES); **Jordi Colomer**, Barcelona (ES); **Thomas Neher**, Sant Marti Sarroca (ES)

(73) Assignee: **Trend Communications, Inc.**, Loudwater (GB)

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H04M 1/24 (2006.01)

(52) **U.S. Cl.** **702/182**; 379/21

(58) **Field of Classification Search** 702/182, 702/57; 379/21; 370/241; 345/905; 356/73.1
See application file for complete search history.

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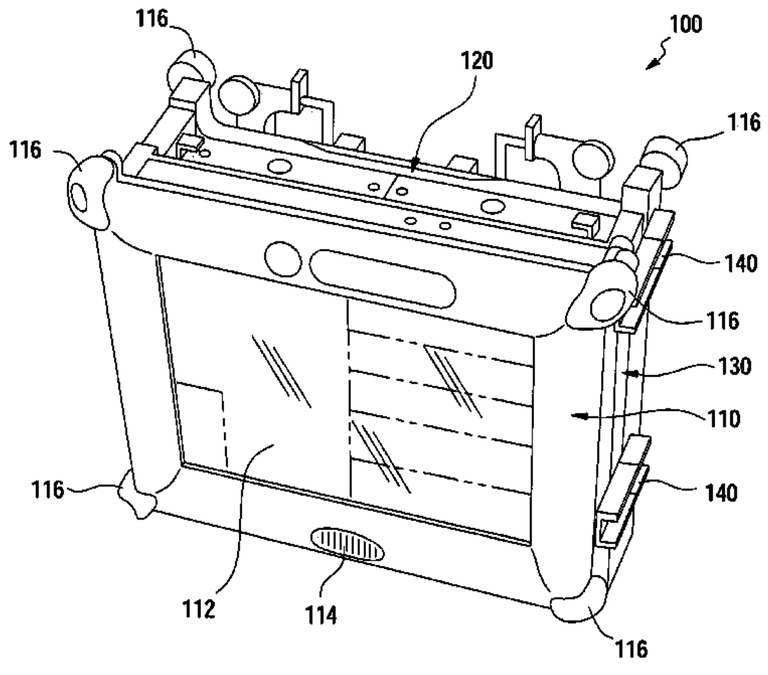
Primary Examiner—John Barlow
Assistant Examiner—Toan M. Le
(74) *Attorney, Agent, or Firm*—Thomas, Kayden, Horstemeyer, & Risley, L.L.P.

(57) **ABSTRACT**

A test unit for data communication networks is formed by placing one or more application modules between a front module and a rear module. The modules are secured together with a latching system and a bus structure provides for control and performance information transfers between modules. The front module may serve a user interface via a touch screen. In addition, the front module has a variety communication ports that provide for one or more remote user interfaces. Battery packs are located in the front module and the rear module for providing power to the test unit.

31 Claims, 10 Drawing Sheets



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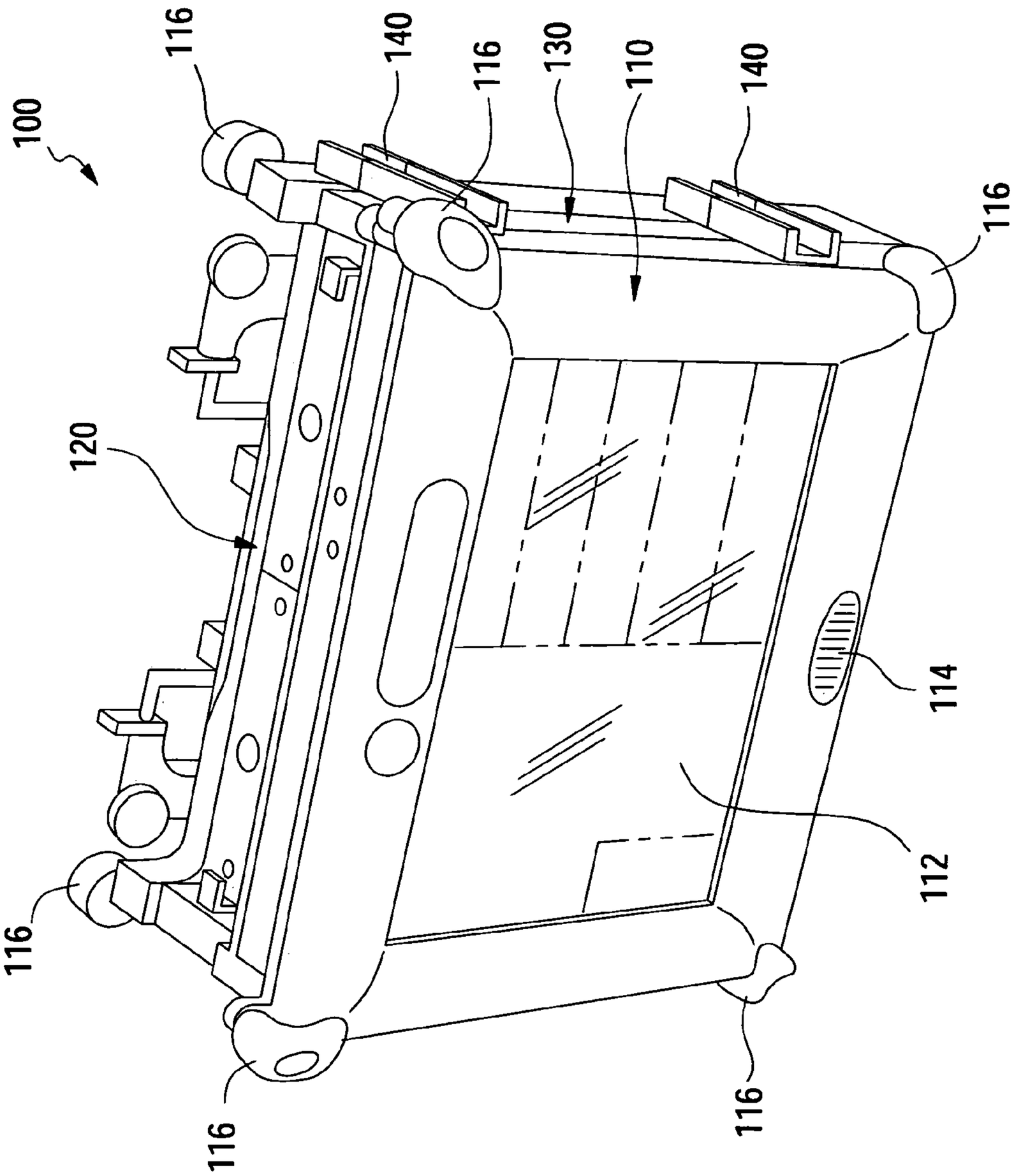

FIG. 1

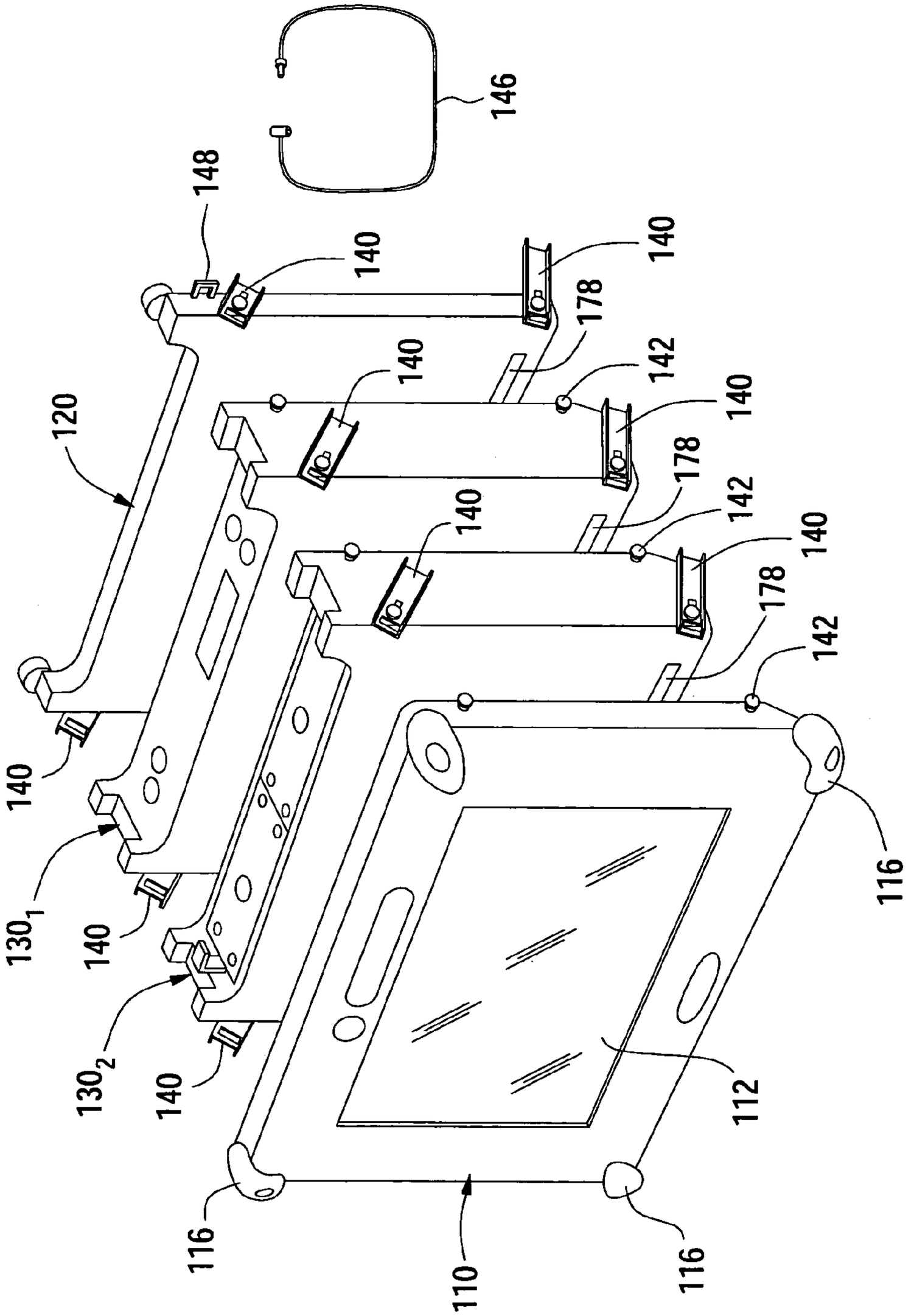

FIG. 2

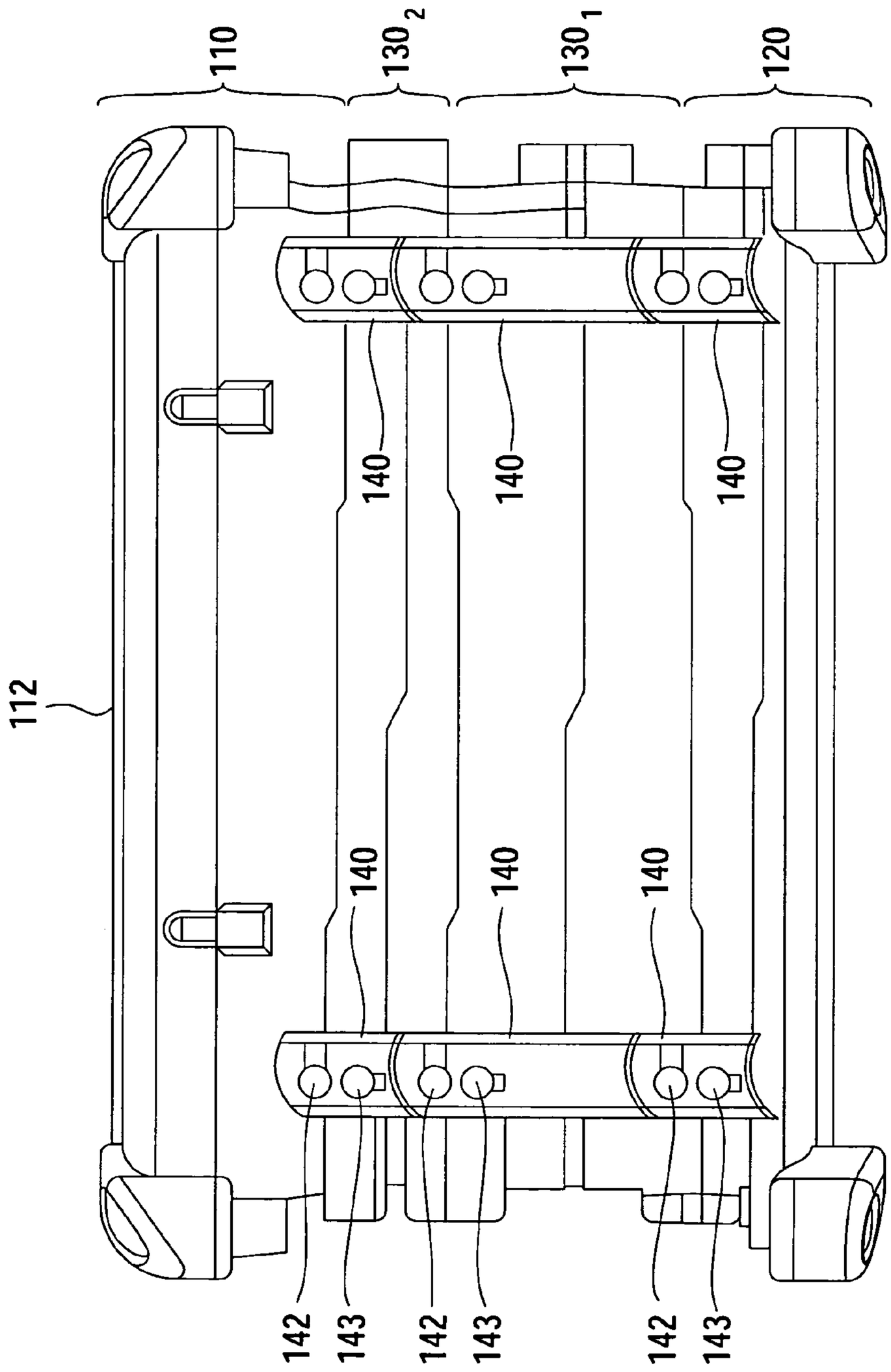
110
130 2
130 1
120
112
140
140
140
140
140
140
142
143
142
143
142
143

FIG. 3A

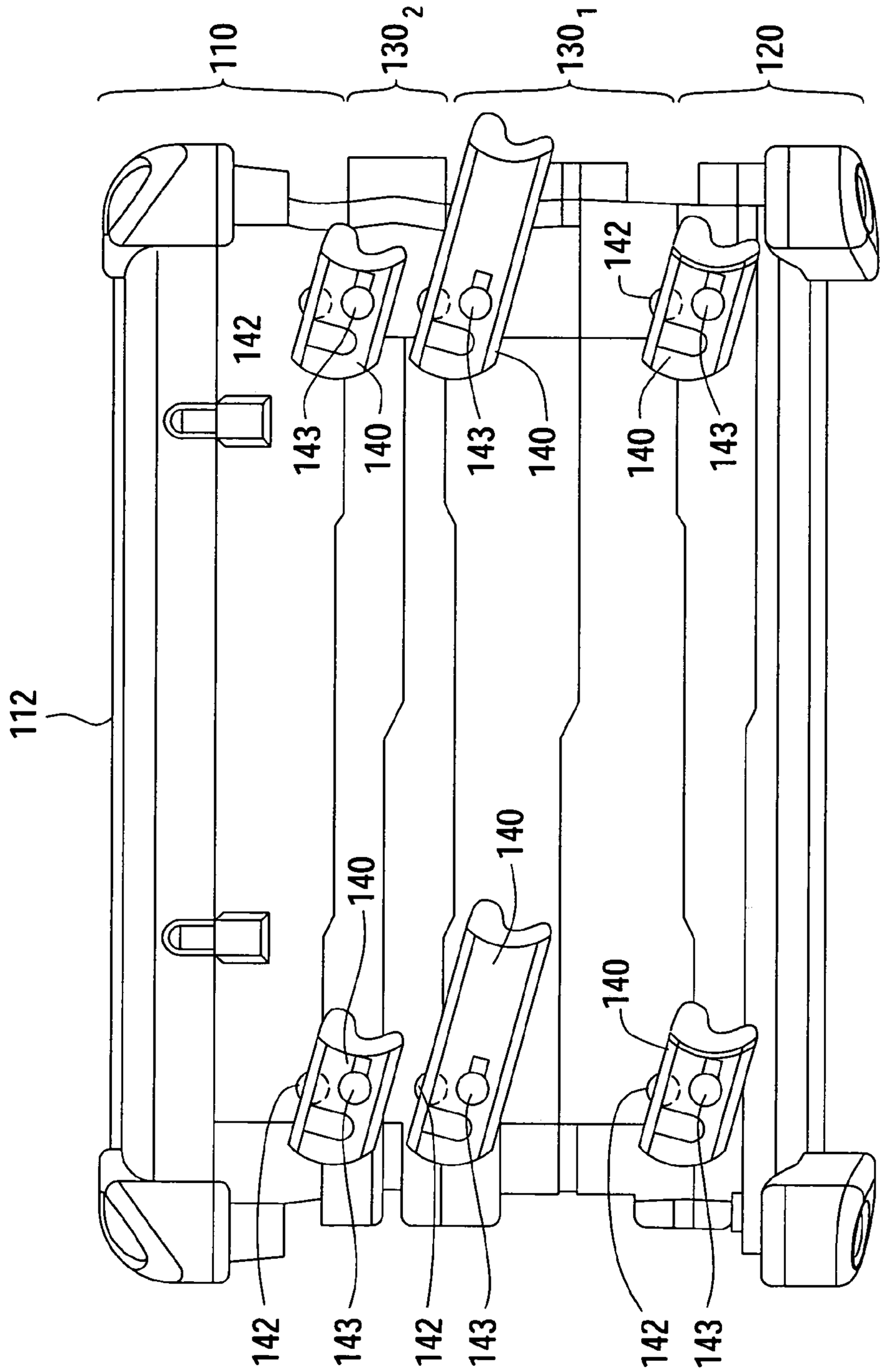
110
130 2
130 1
120
142
142
143
140
143
140
143
140
112
140
140
140
142
143
142
143
142
143

FIG. 3B

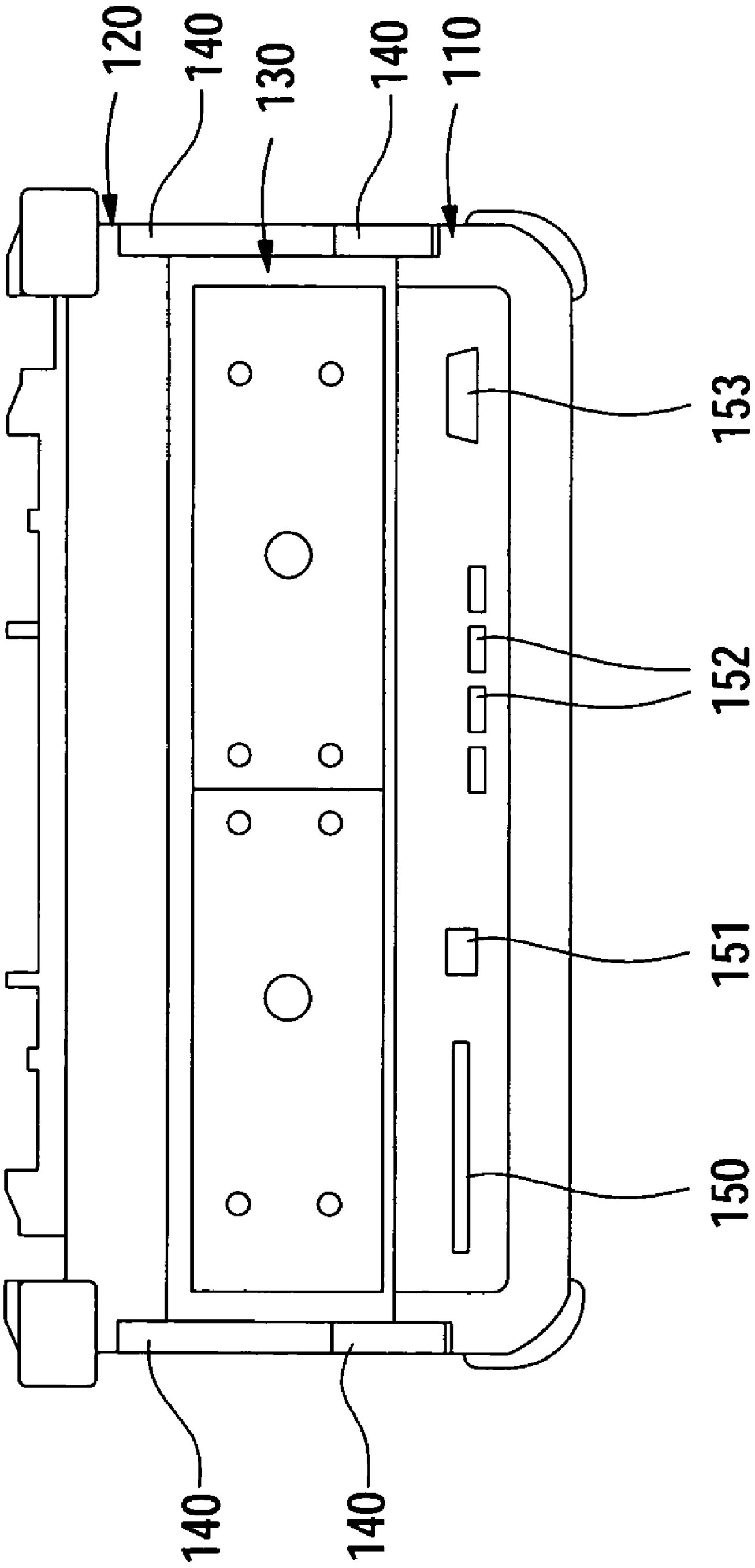

FIG. 4

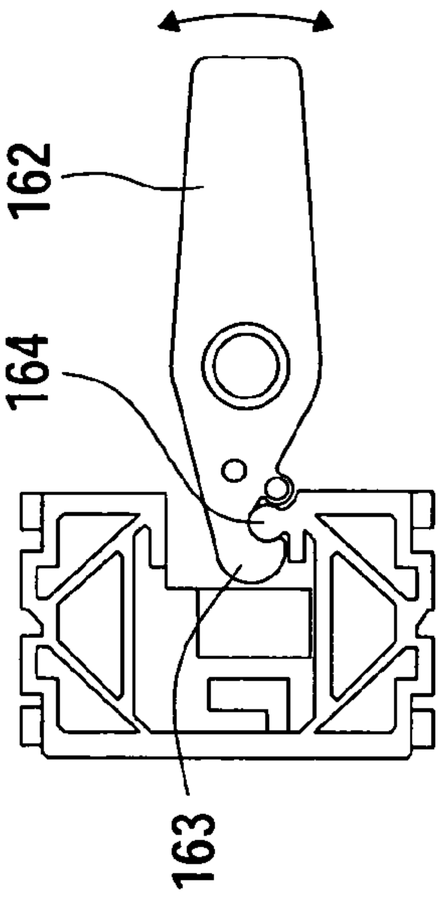

FIG. 5D

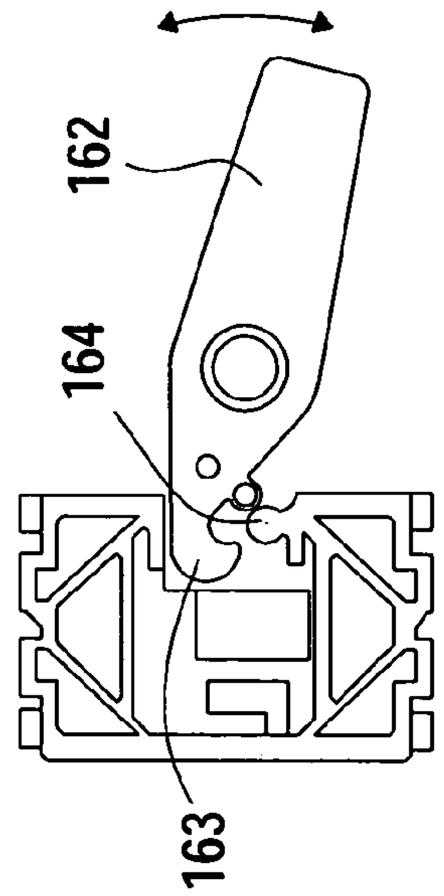

FIG. 5E

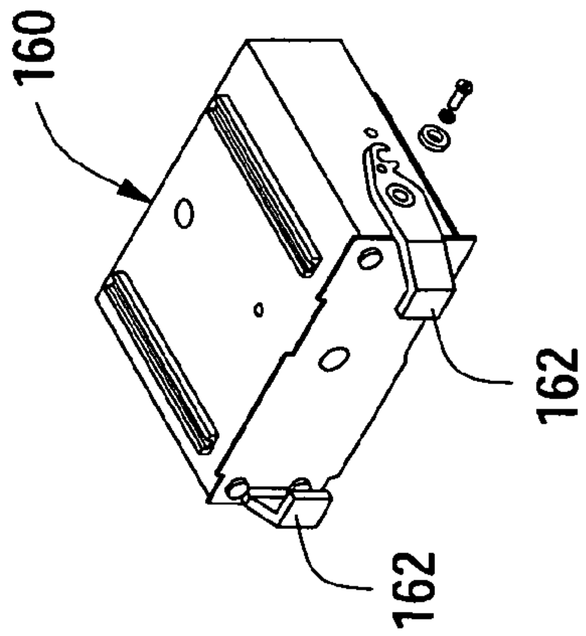

FIG. 5B

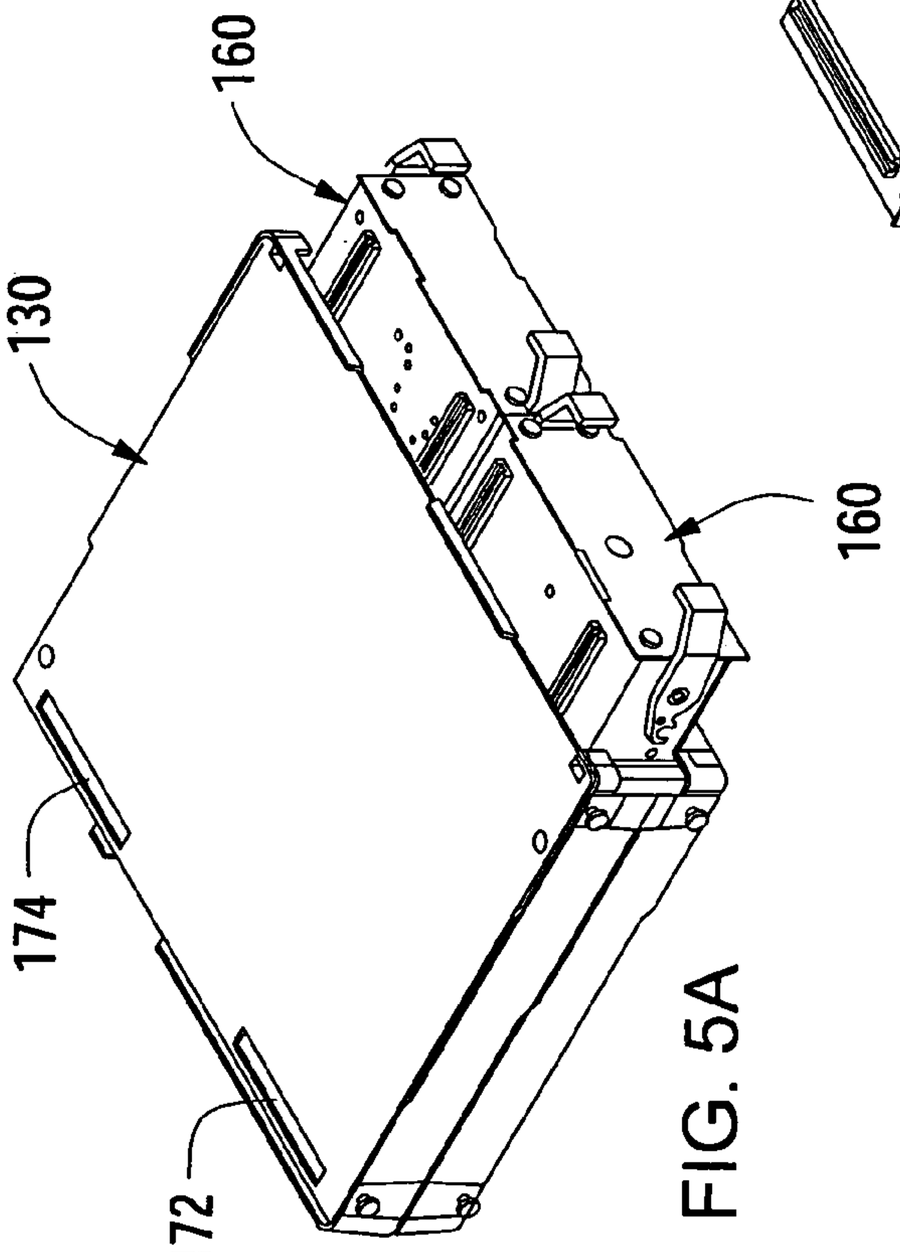

FIG. 5A

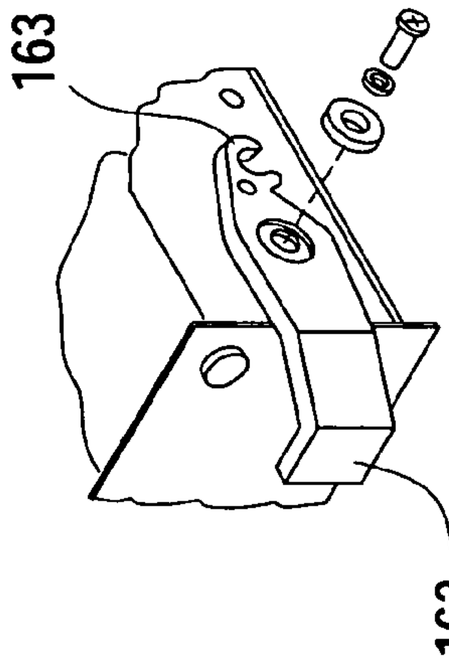

FIG. 5C

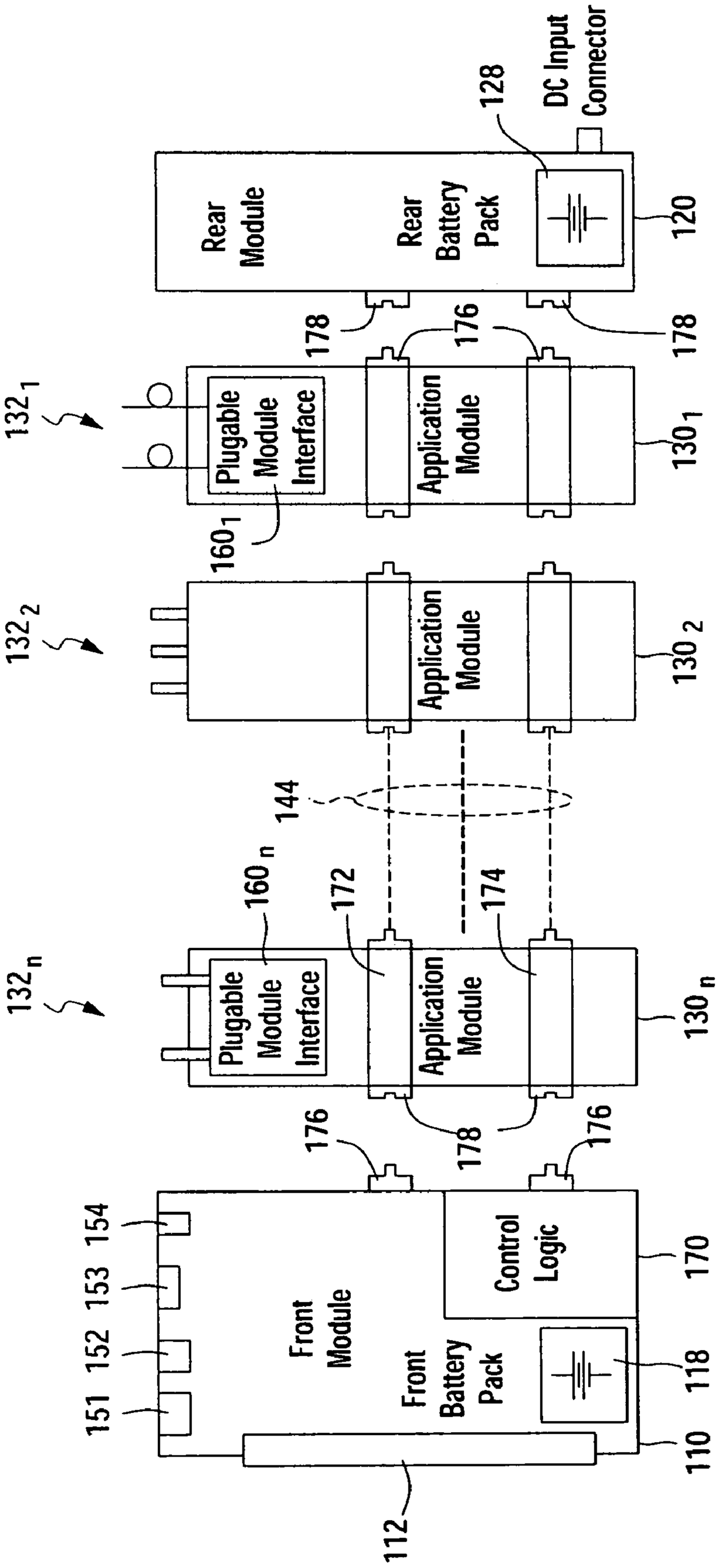
Rear Module
Rear Battery Pack
128
DC Input Connector
120
178
176
178
132_1
Plugable Module Interface
160_1
Application Module
130_1
132_2
Application Module
130_2
144
160_n
172
174
132_n
Plugable Module Interface
Application Module
130_n
176
178
176
154
153
152
151
Front Module
Front Battery Pack
Control Logic
170
118
110
112

FIG. 6

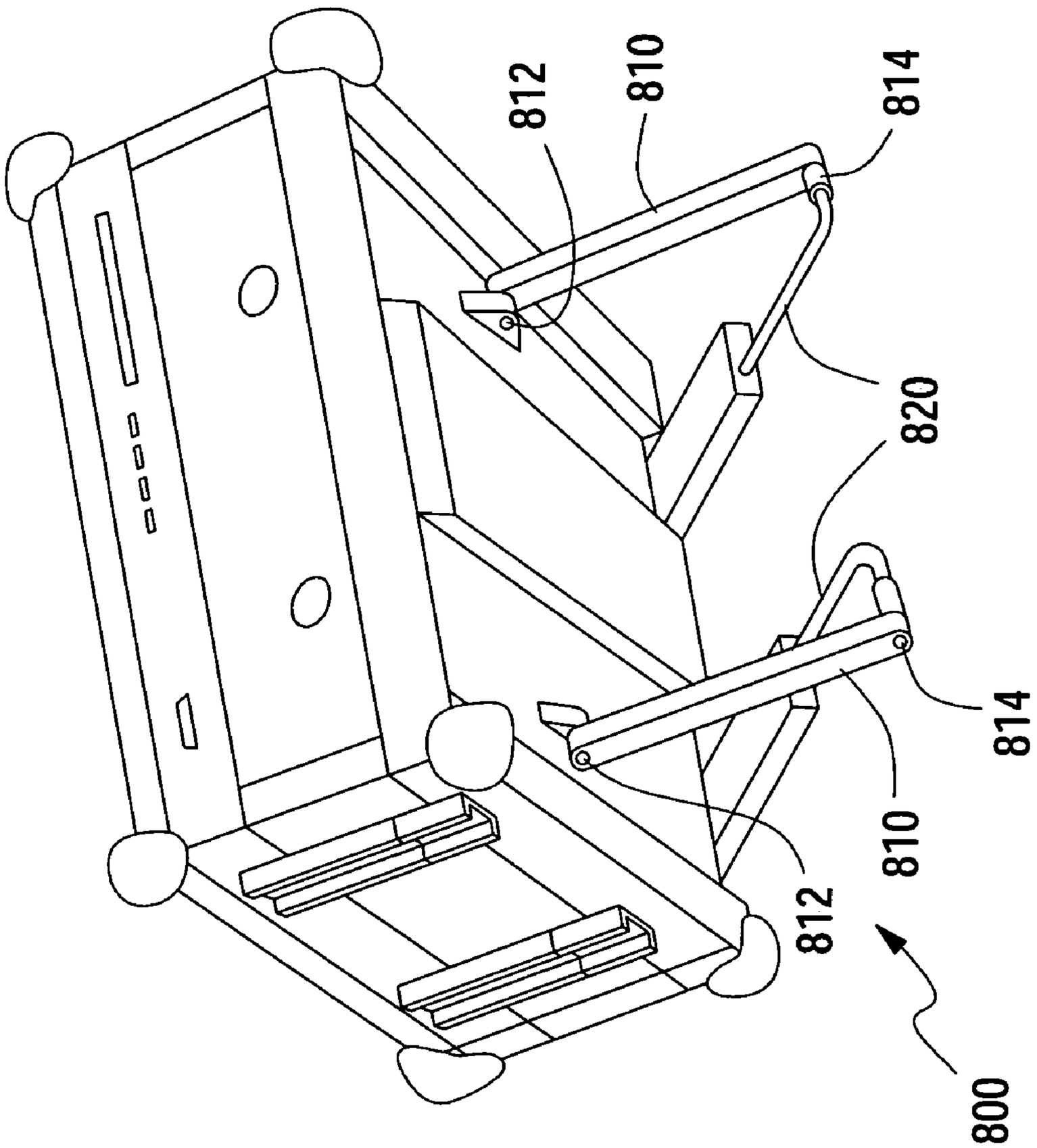

FIG. 7A

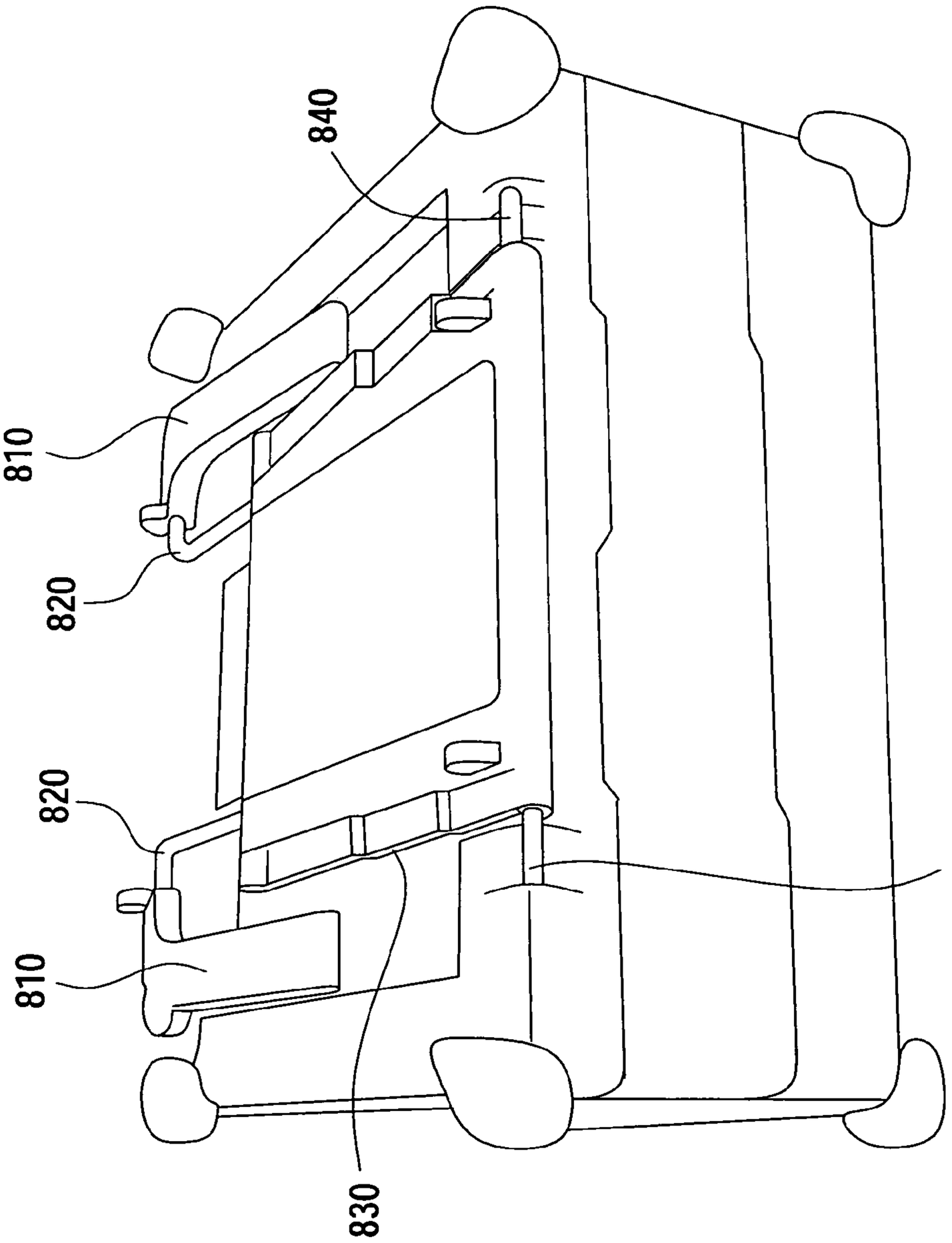

FIG. 7B

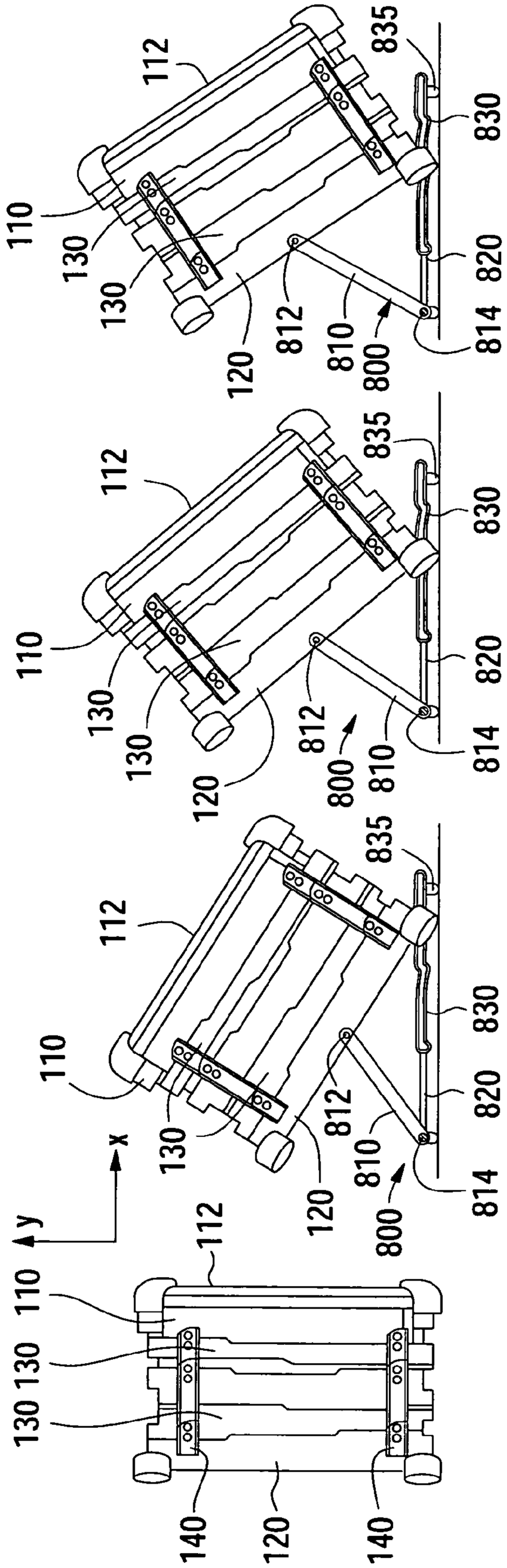

FIG. 8A

FIG. 8B

FIG. 8C

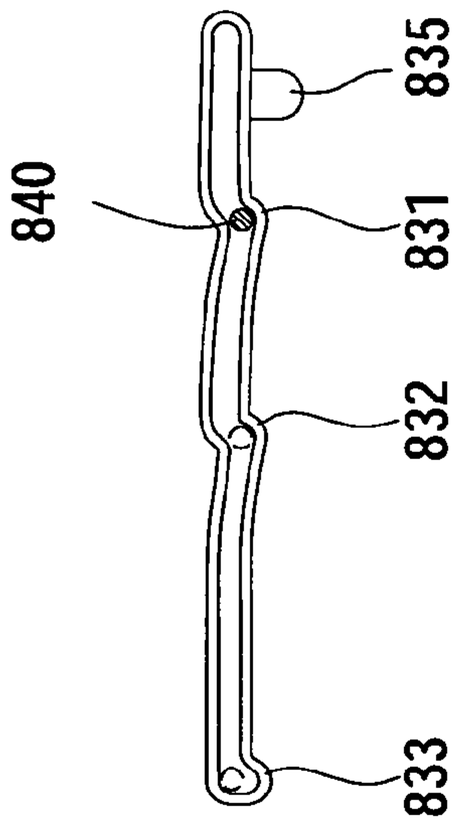

FIG. 8E

FIG. 8D

MODULAR TELECOMMUNICATION TEST UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to the field of telecommunication test equipment and, in particular, to a modular system for providing a plurality of test functions. One or more application modules are coupled between a front module and a rear module wherein each of the application modules is configured to measure performance information associated with a type of communication link.

2. Related Art

Digital communication networks providing a multitude of services such as voice, video and internet connections rely on transport of information over a variety of physical channels and connection protocols. Further, many of the physical channels are connected to multiplexers that combine low-speed data channels into higher-speed data channels. For example, in T-carrier technology, 24 DSO signals of 64 Kbps each are combined to form a single DS**1** signal of 1.544 Mbps. There exists within the telecommunications or data communications network a hierarchy of signals that are described in text books, ANSI Standards, ITU Standards and elsewhere. The world wide data communication network, although continually evolving, is well defined and provides data transport services for a variety of needs from, for example, email, web services, transport of medical images and other known uses.

In order to monitor and evaluate the health of the data communication network or to determine if a communication link of the network is faulty, it is usually necessary to connect test equipment to a variety of communication links or transport layers. When each communication link is monitored to determine if a performance specification is met, then a network provider is able to isolate the problem and restore data communication service to their customers.

One of the problems with existing test equipment is that each test unit is designed to monitor specific types of data links. For example, a first test unit may test data transport over twisted wire pairs and may be capable of testing DS**1**, DS**3** or ISDN service. A second test unit may be used to test for higher speed data links using coaxial cable. Yet a third unit may be utilized to test components of an optical network.

Hence, it is desirable to have a single test unit capable of gathering performance data on various types of data communication links that form the data communication network. Further, it is desirable to have a test unit that is easy to reconfigure or modify in order to adapt to a variety of test scenarios and to meet the test requirements for new data communication technologies.

SUMMARY OF THE INVENTION

Generally, the present invention provides an apparatus, system, and method for monitoring communication links of a data communication network. An apparatus of the present invention is capable of gathering performance data from multiple types of communication links and displaying the performance data on a display screen of the apparatus or at a terminal at a central site of a service provider.

In one embodiment a telecommunication test unit for evaluating the performance of a data link is comprised of a rear module, a front module for controlling the test unit and processing performance information, and one or more application module electrically connected and mechanically secured between the rear module and the front module, wherein each application module is coupled to one or more data links and provides performance information for a display device.

In another embodiment, a method for providing a test unit with performance information about a data communication link comprises the steps of: providing a back module with a power source and a front module for controlling the test unit and receiving performance information, selecting an application module adapted for monitoring the performance of the data link, and stacking the front module, application module, and back module in sequence and electrically connecting and mechanically securing the modules together so that the stacked modules form the test unit.

In another embodiment, the rear module of the test unit has a retractable multi-position foot wherein the multi-positional foot is comprised of one or more support arms pivotally connected on one end to the back of the rear module near the center, an adjustment arm pivotally connected on one end to the other end of each support arm, and a slotted retainer connected to the other end of the adjustment arm wherein slots in the slotted retainer are adapted to snap to a rod on the bottom edge of the rear module.

Various features and advantages of the present invention will become apparent to one skilled in the art upon examination of the following detailed description, when read in conjunction with the accompanying drawings. It is intended that all such features and advantages be included herein within the scope of the present invention and protected by the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention can be better understood with reference to the following drawings. The elements of the drawings are not necessarily to scale relative to each other, emphasis instead being placed upon clearly illustrating the principles of the invention. Furthermore, like reference numerals designate corresponding parts throughout the several views.

FIG. **1** is a diagram of an assembled telecom test unit in accordance with one exemplary embodiment of the present invention.

FIG. **2** is a diagram of the telecom test unit of FIG. **1** illustrating modules positioned for assembly.

FIG. **3**A-B are side views of the test unit of FIG. **1** with the modules of FIG. **2** showing a clip arrangement.

FIG. **4** is a top view of the test unit of FIG. **1**.

FIGS. **5**A-E are diagrams of an application module having sub-modules for the test unit of FIG. **1**.

FIG. **6** is a block diagram illustrating electrical and mechanical connections for the test unit of FIG. **1**.

FIG. **7**A is a rear view of the test unit of FIG. **1** illustrating the multi-position foot of the test unit.

FIG. **7**B is a view of the bottom of the test unit of FIG. **1** illustrating the multi-position foot in a stored position.

FIGS. **8**A-E illustrate a multi-position foot used to provide various viewing angles for the test unit of FIG. **1**.

DETAILED DESCRIPTION

The present invention generally pertains to a telecom test unit used to evaluate the status of various types of communication links of a data communication network. Because different communication links utilize different transport technologies, it is typically necessary to have multiple test units or one test unit that is capable testing a variety of

transport technologies. A test unit capable of testing a variety of transport technologies should be adaptable for meeting the needs of equipment manufacturers and service providers. An exemplary modular test unit described herein, with reference to FIGS. **1** and **2**, has a unique arrangement of stackable modules allowing for multiple functionality of one unit and reuse of a front module and a rear module.

The modular test unit **100** of FIG. **1** has a front module **110**, a rear module **120** and an application module **130** placed therebetween. Although only a single application module **130** is shown in FIG. **1**, additional application modules **130** maybe placed between the front module **110** and the rear module **120**. The front module **110** is shown having a touchscreen **112**, a loudspeaker **114** and protective corner guards **116**. In addition, the front module **110** is battery powered, has one or more processing and memory elements, is connected to a test unit bus ("bus"), has a standby mode display and other elements. The front module **110** preferably receives information and data from one or more application modules, processes and displays the information and data, and in addition functions as an interface between the test unit **100** and a test unit user. The rear module **120** preferably contains a rear battery for furnishing power to the application module **130** and has a connection for charging batteries from an external power source. In addition, the rear module **120** preferably has a multi-position foot, adjustable by the user, for placing the test unit **100** in several viewing positions.

The modular test unit **100** as shown in FIG. **1** is an assembly of stackable modules and, as shown, is available to provide a test function consistent with the installed application module **130**. On the right side of the test unit **100**, fast reconfiguration clips ("clips") **140** are latched to secure the modules together. Preferably there are four clips **140** securing the front module **110** to the application module **130** and four clips securing the rear module **120** to the application module **130**. The clips **140** are adapted for quick latching and unlatching, and the latching and unlatching may occur sequentially, as will be described when referring to FIG. **3**.

FIG. **2** illustrates the test unit **100** before the modules **110**, **120**, **130** of the test unit are secured together with the clips **140**. For position location identification, the application modules **130** are sequentially numbered with subscripts from 1 to N starting at the rear module **120**. Hence the application module $\mathbf{130}_1$ is next to the rear module **120** and the application module $\mathbf{130}_2$ is next to the front module **110** when the subscripts go from 1 to N=2. Each application module $\mathbf{130}_i$ may be adapted to provide a different test function and has a corresponding link processing circuit. The front module **110** is shown with protective corner guards **116** and the touchscreen **112**. In a preferred embodiment, the front module **110** has coupling pins **142**, for attachment to clips **140** on the adjacent application module $\mathbf{130}_2$. When the adjacent application module $\mathbf{130}_2$ is pushed or moved in contact with the front module **110** and electrical connectors are engaged forming a segmented bus **144**, then clips **140** on the adjacent application module are rotated and snap on the coupling pins **142** of the front module **110**. In the embodiment shown by FIG. **1**, there are four coupling pins **142** on the front module **110** and four clips on the adjacent application module $\mathbf{130}_2$. Note that the clips **140** rotate on a pivot pin **143** on the adjacent application module $\mathbf{130}_2$. A second application module $\mathbf{130}_1$, is then coupled to the adjacent application module $\mathbf{130}_2$ by moving the modules together. Coupling pins **142** on both the right and left edges of adjacent application module $\mathbf{130}_2$, near the back, are then engaged when clips **140** on the second application module $\mathbf{130}_1$ are rotated to the latched position. There is also a socket **178** shown on the second application module $\mathbf{130}_1$ that mates with a connector on the back of the adjacent application module $\mathbf{130}_2$ forming a portion of the segmented bus **144**. The rear module **120** is then coupled to the second application module $\mathbf{130}_1$ in a similar manner. When the four modules **110**, $\mathbf{130}_2$, $\mathbf{130}_1$, **120** are secured together electrically and mechanically, the test unit **100** is assembled and configured to provide test functions corresponding to the operation and functionality of the two application modules $\mathbf{130}_2$, $\mathbf{130}_1$.

The segmented bus **144**, partially shown as sockets **178** on the front bottom edges near the right side of the two application modules $\mathbf{130}_{1,2}$ and on the rear module **120**, is adapted to connect to a complementary plugs on the back of each adjacent module. For example, the front module **110** couples electrically to the adjacent application module $\mathbf{130}_2$ via the socket and a complementary plug (not shown) on the backside of the front module **110**. When the test unit **100** is assembled, the segmented bus **144** formed by the sockets and complementary plugs, is utilized for transferring control information, power, and data between and within modules.

Preferably, the front module **110**, the two application modules $\mathbf{130}_2$, $\mathbf{130}_1$, and the rear module **120** are secured together by electrically engaging the modules and then sequentially rotating the clips **140** to a locked position. The sequential rotation starts with the rotation of the clips **140** on the adjacent application module $\mathbf{130}_2$, followed by the rotation of the clips **140** on the second applications module $\mathbf{130}_1$, and ends with the rotation of the clips on the rear module **110**. Because of the offset rounded shapes on each end of the clips **140** (seen clearly in FIGS. **3**A and **3**B), the clips are preferably sequentially engaged in order for the clips to lock the test unit **100** together.

When it is desired to reconfigure the test unit **100**, it may be necessary or desirable for the modules **110**, **120**, $\mathbf{130}_{2,1}$ to be separated. In order to unlatch the clips **140**, the sequential rotation of clips preferably is followed in reverse order. The clips on the rear module **120** are unlatched first, then the clips on the application module $\mathbf{130}_1$ next to the rear unit, are unlatched followed by unlatching the clips on the adjacent application unit $\mathbf{130}_2$. If there are more than two application modules in the stack of modules, then the additional modules are similarly sequentially unlatched. The preferred sequential latching and unlatching of the clips has the benefit of reducing the chance that the clips may be unintentionally released or attached. In addition, the sequential latching and unlatching process provides a means for locking modules **110**, **120**, **130** together with a cable lock **146**. When the cable of cable lock **146** is inserted through the eye of tab **148**, the clip on the rear module **120** next to the tab can not be rotated from the latched to the unlatched position. Because of the sequential unlatching process, none of the clips in the latching chain can be unlatched.

A view of the left side of the test unit **100** of FIG. **1** is shown in FIG. **3**. The front module **110** is the first of the four modules and is followed by an adjacent application module $\mathbf{130}_2$, a second application module $\mathbf{130}_1$ and the rear module **120**. The adjacent application module $\mathbf{130}_2$ in FIG. **3** is approximately an inch thick and the second application module $\mathbf{130}_1$ is approximately two inches thick. On left edge at the top of the test unit **100** is shown a clip **140** secured to coupling pin **142** on the front module **110**. The clip is fastened to the pivot pin **143** near the top of the adjacent module $\mathbf{130}_2$. On the bottom left edge of the adjacent module $\mathbf{130}_2$ is another coupling pin **142** that is secured by the clip **140** that pivots on the pivot pin **143** near the top of

the second application module 130_1. Finally, still on the left edge of FIG. **3**, the clip **140** on left edge of the rear module **120** is coupled to pin **142** on the second applications module 130_1. Similar couplings are preferably on the right edge of the left side, shown on FIG. **3**, and on the right side (not shown) of the test unit **110**. Note that there is no clip on the front module **110** and there is no coupling pin on the rear module **120**. Preferably, there are four clips couplings and holding each of the modules **110**, **120**, **130** together to form the assembled test unit **100**.

Preferably, the test unit **100** is capable of supporting, mechanically and electrically, up to approximately 8 inches of applications modules **130** stacked between the front module **110** and the rear module **120**, although other dimensions are possible. For example, 4 two-inch application modules **130** may be stacked between the front module **110** and the rear module **120**. Other combinations would readily be apparent, such as 2 two-inch application modules **130** and 4 one-inch application modules **130**. Preferably, the application modules **130** may be placed in any order between the front module **110** and the rear module **120** without any loss of functionality. The test unit **100** has a bus **144** that preferably passes through and connects to each of the application modules **130**, wherein the bus is adapted for transferring control information and data to and between each of the application modules **130**. The front module **110**, having control logic **170** with memory and interface circuits, preferably independently activates or turns off any of the application modules **130**. Further, the front module **110** preferably has input/output ports to receive and transfer information and commands to/from local and remote devices. The test unit **100** preferably is capable of simultaneously testing and monitoring different types of data links where one or more types of data links corresponds to each application module **130**. Each application module **130** preferably transmits and/or receives data over different types of communication links and may perform out of service mode loopback tests and other known tests. The stackable module arrangement forming the test unit **100** has the flexibility to adapt to new network technology while meeting the needs of equipment manufacturers, network service providers and network customers.

The test unit **100** preferably communicates with other input/output (I/O) devices using a variety of connection ports as illustrated in the top view of FIG. **4**. Connections to I/O devices are made via ports on the top of the front module **110**. For example, a wireless card may be inserted in wireless card socket **150** for connection to a laptop computer over a wireless link. Preferably, the test unit **100** also has an Ethernet port **151** that may be used for coupling to the internet with internet connected I/O devices. A parallel port **153** is preferably used to couple the test unit **100** to a printer for printing test results. Several USB ports **152** are available on the top of the front module **110** and may be used to connect I/O devices to the test unit **100**. The front module **110** provides the test unit **100** with a variety of means for connecting to external I/O devices. Various other types and numbers of I/O devices may be utilized in other embodiments.

FIGS. **5**A-E are diagrams illustrating an application module **130** having removable sub-modules **160**. Preferably, the application module **130** has two slots with alignment guides for receiving the sub-modules **160** as shown in FIG. **5**A where the sub-modules **160** partially inserted. Preferably, each sub-module **160** has two pivoting latches **162**, shown in FIGS. **5**B and **5**C, that are adapted to secure the sub-module **160** within the housing of the application module **130**. One end of the pivoting latch **162** has a hook-shaped tip **163** that is adapted to lock to a tab **164** inside the housing of application module **130** as seen in FIGS. **5**D and **5**E. FIG. **5**D shows the pivoting latch **162** locked to the tab **164**. The pivoting latch **162** is in the unlocked position in FIG. **5**E. The utilization of sub-modules **160** allows for reducing the cost of application modules **130** that may require hardware changes to be compatible with modified test requirements. The use of sub-modules **160** preferably allows for reuse of components within the application module **130** and may provide new functionality to meet new or different test requirements at a reduced cost.

A block diagram illustrating the electrical and mechanical arrangement for modules **110**, **120**, **130** of the test unit **100** of FIG. **1** is illustrated in FIG. **6**. The front module **110**, on the left side of FIG. **6**, is positioned to receive application modules $130_n, \ldots, 130_1$ and rear module **120**. The modules are shown in unengaged positions. When electrical plugs **176** and sockets **178** are engaged, they form the segmented bus **144** for the test unit **100**. The bus **144** passes through and connects within each of the application modules **130** and has one end within the front module **110** and another end within the rear module **120**. Preferably, the segmented bus **144** is comprised of a telecom/protocol bus **172** and a processor bus **174**. Each of the two busses **172**, **174** preferably transfer data and information at rates to allow for simultaneous control of and data transfer to/from multiple application modules **130**. In a preferred embodiment each of the two busses has a bus data rate of approximately 40 Gbps which is sufficient for supporting up to eight application modules **130**.

As indicated in the discussion of the FIGS. **1** and **4**, the front module has a touchscreen **112** and I/O ports **151**, **152**, **153**, **154** for connecting to external devices. In addition, the front module **110** has a front battery pack **118** and a processor **170**. The segmented bus **144** of the test unit **100** preferably is comprised of a protocol bus **172** and a processor bus **174**. Each of the application modules **130** preferably provides a segment of the segmented bus **144**. The bus has end segments on the front module **110** and the rear module **120**. The control logic **170** preferably is adapted to provide logic and data processing functions for responding to information and data on the protocol bus **172** and the processor bus **174**, and for responding to connections to external devices. The front battery pack **118** preferably provides power to the front module **110** when the rear module **120** and application modules **130** are not connected.

As indicated earlier there is a multiplicity of application modules **130** having the functionality to test a variety of network links. As shown in FIG. **6**, the application module 130_n contains one or more sub-modules 160_n. Connectors 132_n on application module 130_n preferably are elements of the sub-module and provide, for example, connections to test DS-3 or DS-1 communication links. Another application module 130_2 does not use sub-modules and may be used, for example, to test ISDN communication links. A third application module 130_1 preferably has two sub-modules 130_1 adapted to connect to an optical link for monitoring SDH/SONET communication links. Although the test unit **100** preferably is adapted for supporting up to eight application modules **130**, the number of application modules that is acceptable in a stack of modules is limited only by size and weight. As test requirements and communication technology evolve, updated and new application modules **130** preferably are developed to meet new requirements.

The rear module **120**, as shown in FIG. **6**, preferably has a rear battery pack **128** and sockets **178** for connecting the

rear module to the bus the test unit **100**. The rear module preferably has a connection (not shown) for charging the rear battery pack **128** and may also charge the front battery pack **118** using wires of the bus. In addition the rear module **120** has a multi-position foot that will be described in detail in discussions of FIGS. **7** and **8**. The multi-position foot allows a user to place the test unit **100** in multiple viewing positions.

A perspective view of the test unit **100** showing details and the operation of the multi-position foot **800** is illustrated in FIG. **7**A. The multi-position foot **800** preferably has two support arms **810** pivotally coupled on a first end to the midpoint of each edge on the backside of the rear module **120**. The second end of each support arm **812** is adapted for resting on a horizontal surface such as a desk top or bench top. The second end of each support arm **810** is also pivotally coupled to one end of a bottom bar **820**. There is one bottom bar **820** for each support bar **812**. The other end of each bottom bar has a slotted retainer **830**. Each slotted retainer **830** has a support protrusion and there is also a support protrusion near the intersection of the support arm **810** and the bottom bar **820**.

FIG. **7**B is a view of the rear module **120** showing the multi-position foot **800** in a retracted position with the support arms **810** and bottom bars **820** against the bottom of the rear module. A round adjustment rod **840** is shown on the front edge of the rear module **120** of test unit **100**.

FIG. **8**A shows the test unit **100** with the bottom of the test unit resting on a horizontal support surface with the display screen **112** on the front module **110** in a vertical position. The multi-position foot **800** is retracted in FIG. **8**A and cannot be seen when viewing the test unit from the side.

FIGS. **8**B-D show the test unit **100** oriented in three different viewing positions. Details of the slotted retainer **830** for each of the three positions is shown in FIG. **8**E. FIG. **8**B shows the viewing screen making an angle of approximately thirty degrees with the horizontal support surface. Support arm **810** is shown connected to a first pivot point **812** located on the rear module **120**. The other end of the support arm **810** is connected at a second pivot point **814** on the bottom bar **820** and a support protrusion extends downward from the second pivot point. The second end of bottom bar **820** is a slotted retainer **830** that preferably has three slots as best seen in FIG. **8**E. A round adjustment rod **840** oriented perpendicular to the x-y plane is attached near the bottom of the backside of the rear module **110**. The adjustment rod **840** is adapted to fit into slots in the slotted retainer **830**. The slotted retainer **830** preferably has three slots **831**, **832**, **833** adapted to function as retaining notches as best seen in FIGS. **8**E. As indicated above, when the multi-position foot **800** is stored against the back of the rear module the test unit preferably sits on the bottom of the test unit **100** and the touchscreen **112** is in vertical position. However if it is desirable to have touchscreen **112** positioned for horizontal viewing, the test unit **100** may rest on the backside of the rear module **110**.

The multi-position foot **800** preferably provides the test unit **100** with an additional three angles for viewing the screen that are between the vertical view and the horizontal view. Referring now to FIG. **8**B there is shown the test unit **100** position at a first angle where the backside of the rear module **110** makes an angle of around thirty degrees with respect to surface on which the unit **100** sits. The adjustment rod **840** is placed in the first slot **831**. In order to orient the test unit in a second viewing position of around forty five degrees, the adjustment rod **840** is removed from the first slot **831**, and moved in the negative x direction and placed in the second slot **832**. If it is desired to have the touchscreen **112** viewed at an angle of around sixty degrees, then the adjustment rod **840** is moved to a third slot **833**. The test unit **100** preferably has the touch screen **112** selectively viewable either horizontally, vertically or at one the three angles provided by the multi-position foot **800**. The number of viewing positions provided by the multi-position foot **800** may be fewer or more than three and preferably is provided by having fewer or more slots in the slotted retainer **830**.

Because a user can move the adjustment rod **840** out of and into the slots in the slotted retainer **830**, the multi-position foot **800** requires no tools for changing viewing positions. In addition, the multi-position foot **800** provides the same viewing angle for a user independent of the number application modules **130** secured between the front module **110** and rear module **120** of the test unit **100**. In the preferred embodiment, the support arm **810** is made of plastic, the bottom bar **820** is made of metal, the slotted retainer **830** is made of plastic, and the adjustment bar **840** is made of metal. The pivot points **812** and **814** may be fabricated using a variety of methods as would be understood by one skilled in the art.

As a means for increasing battery life, test unit **100** is provided with a power management system wherein the test unit has three possible power states controlled by the power management system. In the ON-state, the test unit **100** is fully operational wherein the front module **110** and application modules **130** are using power as determined by a selected functionality. The test unit **100** may also operate in a SLEEP-state where there is a limited module operation, but sufficient to allow the test unit to transition to the ON-state in a few milliseconds. The power management system is adapted for supplying power to critical circuits when the test unit **100** is in the SLEEP-state. The third state of the power management system is the OFF-state where preferably power supply circuitry, such as battery charging circuits, remain functional and several selected circuits and switches are functional. The power management system allows the test unit **100** to operate on battery power for longer periods of time than was possible when the states of test unit were limited to fully on or fully off.

It should be emphasized that the above-described embodiments of the present invention, particularly, any "preferred" embodiments, are merely possible examples of implementations, merely set forth for a clear understanding of the principles of the invention. Many variations and modifications may be made to the above-described embodiments of the invention without departing substantially from the spirit and principles of the invention. All such modifications and variations are intended to be included herein within the scope of this disclosure and the present invention and protected by the following claims.

The invention claimed is:

1. A telecommunication test unit for evaluating the performance of a data link, the test unit comprising:

a rear module;

a front module for controlling the test unit and processing performance information indicative of the performance of the data link;

an application module electrically connected and mechanically secured between the rear module and the front module, wherein the application module is coupled to the data link and is configured to provide the performance information to the front module; and

a multi-position foot for positioning the test unit in different orientations, the multi-position foot comprising:

a first pivotable support arm coupled to a first bar having a slotted retainer; and

an adjustment rod extending into the slotted retainer, the adjustment rod movable to different slots of the slotted retainer, wherein the test unit is placed in a different orientation by moving the adjustment rod to a different one of the slots.

2. The test unit of claim **1**, wherein one or more additional application modules is placed between the front module and the rear module.

3. The test unit of claim **1**, wherein the front module has one or more ports for coupling to an external user interface.

4. The test unit of claim **1**, wherein the external user interface is a personal computer.

5. The test unit of claim **1**, wherein the front module has a user interface.

6. The test unit of claim **1**, wherein the rear module has a battery for providing power to the application module.

7. The test unit of claim **1**, wherein the multi-position foot further comprises a second pivotable support arm coupled to a second bar, wherein the adjustment rod extends between the first bar and the second bar.

8. A method for providing a test unit to obtain performance information of a data communication link, the method comprising the steps of:

providing a back module with a power source;

providing a front module for controlling the test unit and receiving performance information;

selecting an application module adapted for monitoring the performance of one or more data links;

stacking the front module, application module, and back module in sequence and electrically connecting and mechanically securing the modules together so that the stacked modules form the test unit;

providing electrical power from the power source of the back module to the application module;

monitoring, via the test unit, the performance of one or more data links; and

displaying results of the monitoring step.

9. The method of claim **8**, further comprising the step of providing electrical power from the power source to the front module.

10. The method of claim **9**, further comprising the step of providing electrical power from a power source in the front module to components of the front module.

11. The method of claim **10**, wherein the step of providing electrical power from the power source in the front module is based on the connecting step.

12. A system for providing a multifunction test unit, the system comprising:

a back module having a power supply;

a front module having control logic for controlling the system and processing performance information; and

two or more application modules secured between the back module and the front module wherein each of the application modules is adapted to provide performance information about a different type of communication link, wherein each application module furnishes performance information to the front module, and wherein the power supply of the back module provides electrical power to the each of the application modules.

13. The system of claim **12**, wherein the power supply provides electrical power to the front module.

14. The system of claim **13**, wherein the front module has a power supply that provides electrical power to components of the front module.

15. A system for providing a multifunction test unit, the system comprising:

a back module having a power supply;

a front module having control logic for controlling the system and processing performance information; and

two or more application modules secured between the back module and the front module, wherein each of the application modules is adapted to provide performance information about a different type of communication link, wherein each application module furnishes performance information to the front module,

wherein the back module has a multi-positional foot comprising:

a set of support arms that pivot near the center of the back module;

an adjustment arm for each of the support arms that is pivotally coupled to each of the support arms on one end and has a slotted retainer with multiple slots on the other end; and

a rod secured to the bottom back edge of the back module that is coupled to the slotted retainers wherein a multiple viewing angles are provided by the slot location of the rod within the slotted retainer.

16. A method of stacking and latching electronic modules to provide a test apparatus the method comprising the steps of:

positioning a front module to receive an application module;

placing a first application module on the front module and electrically coupling the first application module to the front module and then latching the application module to the front module;

stacking and latching one or more additional application modules to the first application module, thereby increasing the functionality of the test apparatus;

securing a back module to the last application module of the stacking step;

pivoting a first support arm about a point on the test apparatus, the first support arm having a slotted retainer; and

moving an adjustment rod to different slots of the slotted retainer such that an orientation of the test apparatus is changed;

monitoring, via the test apparatus, the performance of one or more data links; and

displaying results of the monitoring step.

17. The method of claim **16**, wherein a bus structure between the front module and the back module is connected to each of the application modules.

18. The method of claim **17**, wherein the bus structure comprises a protocol bus and a processor bus.

19. The method of claim **17**, wherein the rear module has a rear battery pack that provides electrical power to each of the application modules.

20. The method of claim **19**, wherein the front module has a display panel.

21. The method of claim **20**, wherein the display panel is a touch screen.

22. The method of claim **17**, wherein the front module has multiple connectivity ports.

23. The method of claim **16**, further comprising the step of pivoting a second support arm about a point on the test apparatus, the second support arm coupled to a second bar, wherein the adjustment rod extends between the first bar and the second bar.

24. A telecommunication test unit for evaluating the performance of a data link, the test unit comprising:

a first module having control logic; and

a plurality of removable application modules stacked on and communicatively coupled to the first module the application modules configured to respectively perform different types of tests on at least one data link, each of the application modules having a rotatable latch that rotates to mate with a respective latch of another of the application modules,

wherein the control logic is configured to receive diagnostic information from each of the application modules and to provide an output indicative of the diagnostic information.

25. The test unit of claim **24**, further comprising a segmented bus passing through each of the application modules, wherein each of the application modules is configured to communicate with the control logic over the segmented bus.

26. The test unit of claim **24**, wherein at least one latch of one of the application modules has a rounded end for mating with a rounded end of another latch.

27. The test unit of claim **26**, further comprising a module stacked on one of the application modules and having a power source for providing electrical power to each of the application modules.

28. A telecommunication test unit for evaluating the performance of a data link, the test unit comprising:

a first module having control logic; and

a plurality of removable application modules stacked on and communicatively coupled to the first module the application modules configured to respectively perform different types of tests on at least one data link,

a segmented bus passing through each of the application modules, wherein each of the application modules is configured to communicate with the control logic over the segmented bus, wherein the control logic is configured to receive diagnostic information from each of the application modules and to provide an output indicative of the diagnostic information, and wherein the test unit further comprises a multi-position foot for positioning the test unit in different orientations, the multi-position foot comprising:

a first support arm coupled to a first bar having a slotted retainer;

a second support arm coupled to a second bar; and

an adjustment rod extending into the slotted retainer and between the first bar and the second bar, the adjustment rod movable to different slots of the slotted retainer, wherein the test unit is placed in a different orientation by moving the adjustment rod to a different one of the slots.

29. A method for evaluating the performance of data links, comprising the steps of:

providing a telecommunication test unit having an output module;

stacking at least a first application module and a second application module on the output module, each of the first and second application modules removable from the telecommunication test unit;

securing the first application module and the second application module, the securing step comprising the step of rotating a respective latch on each of the application modules until said respective latch mates with another latch on one of the other modules;

testing a first data link via the first application module;

testing a second data link via the second application module; and

outputting from the output module diagnostic information based on each of the testing steps.

30. The method of claim **29**, further comprising the step of transmitting a portion of the diagnostic information from the second application module to the output module via a segmented bus, the segmented bus having a first segment on the first application module, a second segment on the second application module, and a third segment on the output module.

31. The method of claim **29**, wherein at least one latch of one of the application modules has a rounded end for mating with a rounded end of another latch.

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